



Combinatorial Principle in the Use of Drum (*Kendhang*) Formulae in Gamelan Music of Yogyakarta. From Prescriptive Models to the Interpretation of a Composition: the Case of *Kendhang Pinatut*.

Luca Pietrosanti

Sapienza University of Rome, Piazzale Aldo Moro 5, Rome 00185, Italy
email: nanaqui2013@hotmail.com

ABSTRACT

In this paper, I address the question to the use of drums (*kendhang*) in the traditional Gamelan music of Yogyakarta, by presenting some prescriptive models (or formulas). I illustrate how, the use of different prescriptive models in a composition follow what I labeled as “Combinatorial Principle”. In order to describe the essential elements of this principle, I will analyze the modalities of interaction between a very flexible drum formula (known as *pinatut*) and three other prescriptive models for drum within some exemplary pieces of traditional Gamelan music. The concept of combinatorial principle illustrated in these pages, on the one hand explains the way of interaction between the drum’s rhythmic formulas and their capacity to influence the choices made by the entire orchestra during a performance; on the other hand, through this principle we are able to trace a path that attempts to understand the “deep structures” that are the basics of making music in Gamelan *tout court*. Through the perspective of the combinatorial principle it is possible to analyze the prescriptive models and techniques of many other instruments of the Gamelan of central Java.

Keywords: Gamelan, *kendhang* (or *kendang*), drums, prescriptive models, formulas, *pinatut*.

INTRODUCTION

Listening to different versions of the same piece of traditional music for Gamelan is something that happens frequently. This is not only about the ability or the expressiveness of the musicians, but it also concerns aspects such as the duration, the execution of one or more sections of a song, the use various instrument techniques, etc. Thus, a piece of traditional music for Gamelan is a flexible and interpretable entity. While observing how a piece of traditional music is realized, we have to consider that each musician doesn’t necessarily follow a score, but instead, he calls to mind and elaborates prescriptive models and playing techniques for each instrument starting from the same nucleus of organized sounds (*balungan*). Through the creative application of shared rules of composition based on manipulation of melodic and

rhythmic formulas inherited from tradition, musicians generate a collective melody, which is the result of the overlap of multiple layered melodies, rhythms and timbres. Therefore, a piece of traditional music is recreated every time. Although the identity of a composition is maintained and, in general, there are exemplary performances in which musicians are inspired, a simple variation of a sound or a melodic-rhythmic pattern can be distinguished as a regional or personal style.

Each musician can contribute with his own instrument to the overall character of a song. In the case of the drum (*kendhang*), the choice of a certain model during the performance is decisive for the final result of the composition. Among all the instruments that compose a Gamelan orchestra, the drum plays a role of particular significance: it controls and manages all the dynamic processes that come into play during a performance. Viewed through the perspective of a particular “conductor”, the *kendhang* player influences the way of playing of the other musicians; for example, through his rhythmic formulas, he is able to indicate which section of a song must be performed, what kind of technique can be adopted by the other instruments, when the singers can enter the composition, and giving signals for the speed variation, for the opening and the closing of a piece, etc. Therefore, the study of the rhythmic formulas of the drum leads us to the heart of the performance of traditional Gamelan music.

MATERIALS AND METHODS

In this paper I will start to talk about the concept of “*kendhang* formula”, focusing on the aspects that can qualify a certain succession of sounds as a “formula”; then I will move to the presentation of some prescriptive models used in Gamelan music in Yogyakarta; finally, through the analysis of some Gamelan pieces, I will show how the interaction and manipulation of prescriptive models for the drum follow a combinatorial principle, which is articulated in three interconnected processes: 1) caesura of a rhythmic formula in one of the moments of the composition marked by some instruments with accentual function; 2) re-use and re-contextualization of a formula (or a part of it) both in the same and in different musical forms; 3) time variation.

DISCUSSION

1. Kendhang Formulae.

There are many factors that determine the rhythmic sequence of a prescriptive model for the drum. Although today the prescriptive models are learned and circulate more and more in written form, they still represent the result of consolidated performance practices transmitted orally for a long time. For this reason we can find a lot of variations (regional or personal). In this study I consider only some formal-type variables (through which the identity of a formula is maintained) leaving out those “surface” aspects such as specific sounds or patterns used in a certain rhythmic sequence.

1.1. Type of Drum and rhythmic formulae.

The rhythmic formulas that can be used in a composition depends primarily on the type of drum used. In the big Gamelan orchestras of Central Java there are three types of double-head drums of different sizes: the largest one takes the name of *kendhang Ageng*; the medium size drum is named *kendhang Batangan*; the smallest one is called *kendhang ketipung*. The largest of the three drums can be played individually (*satunggal*, lit. "one") or together with the smaller drum: this configuration is called *kendhang kalih* (lit. "two drums"). In this study, I focused on the latter type (or combination) of drum. Thus, the formulas that will be presented and analyzed in the following pages are all performed with the *kendhang kalih*.

1.2. Structure of a composition and rhythmic formulae.

The second aspect that determines a rhythmic formula is the musical form (*bentuk*) of a piece of traditional music. This is defined by a particular distribution of "accents" represented by an organized succession of a group of instruments of the orchestra, i.e. *gong*, *kempul*, *kenong*, *kethuk*, *kempyang*. The first two instruments mentioned form the group of the large gongs suspended vertically; the others form the medium and small size group of gongs arranged horizontally. In general these instruments have a limited register (only one sound in the case of *gong*, *kethuk* and *kempyang*) and their use during the performance is to create engravings in the melody. Because of their specific use, the ethnomusicologist Jaap Kunst labeled these instruments as "colotomy". (Kunst, 1973). In this paper I analyze only two of the many musical forms in which Gamelan repertoires are divided in, i.e. the form *lancaran* and *ladrang*. These forms are presented below in the cipher notation used in the Gamelan music (note: they are layed out following the methods of transcription commonly adopted by the Javanese):

<div style="display: flex; flex-direction: column; align-items: center;"> <div>⌣+ = <i>kethuk</i></div> <div>⌣ = <i>kempul</i></div> <div>⌣ = <i>kenong</i></div> <div>○ = <i>gong</i></div> <div>• = <i>beat</i></div> </div>	<p>Bentuk Lancaran</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div> <div style="display: flex; align-items: center;">+ + ⌣</div> <div style="display: flex; align-items: center;">• • • •</div> </div> <div> <div style="display: flex; align-items: center;">+ ⌣ + ⌣</div> <div style="display: flex; align-items: center;">• • • •</div> </div> <div> <div style="display: flex; align-items: center;">+ ⌣ + ⌣</div> <div style="display: flex; align-items: center;">• • • •</div> </div> <div> <div style="display: flex; align-items: center;">+ ⌣ + ⌣</div> <div style="display: flex; align-items: center;">• • • ○</div> </div> </div>
--	--

Bentuk Ladrang

<div style="display: flex; align-items: center;">+ +</div> <div style="display: flex; align-items: center;">• • • •</div>	<div style="display: flex; align-items: center;">+ ⌣</div> <div style="display: flex; align-items: center;">• • • •</div>
<div style="display: flex; align-items: center;">+ ⌣</div> <div style="display: flex; align-items: center;">• • • •</div>	<div style="display: flex; align-items: center;">+ ⌣</div> <div style="display: flex; align-items: center;">• • • •</div>
<div style="display: flex; align-items: center;">+ ⌣</div> <div style="display: flex; align-items: center;">• • • •</div>	<div style="display: flex; align-items: center;">+ ⌣</div> <div style="display: flex; align-items: center;">• • • •</div>
<div style="display: flex; align-items: center;">+ ⌣</div> <div style="display: flex; align-items: center;">• • • •</div>	<div style="display: flex; align-items: center;">+ ⌣</div> <div style="display: flex; align-items: center;">• • • ○</div>

Although there are cases of formulas developed for a specific song, in general the same prescriptive model is valid for any composition which has the same structure made by the succession of the *colotomic* instruments. They are common prescriptive models (*umum*) that take their name from the musical form they belong to: we say *kendhangan lancaran* (lit. drumming *lancaran*) in the case of the form *lancaran*, and *kendhangan ladrang* (lit. drumming *ladrang*) in the case of the form *ladrang*.

1.3. Level of *irama* and rhythmic formulae.

A third element that determines the type of rhythmic sequence used to work out composition is represented by the “level of *irama*”. The Theory of Central Java Gamelan defines four levels of *irama*. In the tradition of Yogyakarta these levels are distinguished by using the roman numerals I, II, III and IV. *Irama* is a concept that deserves its own detailed discussion, however, in this paper we will focus only on some essential aspects, which are as follows:

- *Time*: a level of *irama* can be in a certain way associated to the time speed. In gamelan music theory there are three types of time: *cepat* (or *seseg* = fast); *sedang* (or *tanggung* = medium, moderate); *lambat* (= slow). These are general indications, not exactly quantifiable and must be contextualized in the song played, while respecting the character or the spirit of a composition. For instance, depending on the case, playing in “*irama I*” could mean playing on a fast or moderate time; playing in “*irama II*” could mean playing on a medium or slow time.
- *Proportionality*: each *irama* is the result of a different rhythmic layering level within it is possible to conceive a certain melodic and rhythmic formula. Different levels of *irama* are in a proportional relationship with each other: a level of *irama* is in relation to the next with a ratio of 2:1. Consequently, even the melodic-rhythmic elaborations of an instrument in different levels of *irama* will have the same proportional relationship in quantitative terms. This can be also applied to the drum, which adopts different rhythmic formulas based on the level of *irama* in which such models are executed.
- *Instrument technique*: depending on the level of *irama* many instruments of the orchestra realize different melodic-rhythmic techniques.

To summarize, we can say that the level of *irama* expresses the relationship between time, stratified dimension of the instrumental parts and the playing technique of an instrument.

Type of drum, form of a composition, and level of *irama* are three elements that determine the identity of a formula and do not depend on stylistic variables. The drummer, whatever the rhythmic formula he chooses, must consider these elements during the performance.

Prescriptive models *umum*.

I illustrate below the prescriptive models used to work out the form of a composition (see 1.2) I learned during my studies of traditional music in Yogyakarta. Such models admit of course variants in terms of played sounds, but as mentioned, we are not going to consider that, as it does not influence the mechanisms that are going to be analyzed in the following pages. Formulas for the form *lancaran* (*irama I*) and *ladrang* (*irama I* and *II*) are presented below in cypher notation, by using one of the many ways of drum

sounds transcription adopted in Yogyakarta. In addition to the use of letters to indicate the sounds, the reader also must pay attention to the use of one or more horizontal bars placed over two sounds, which indicates fractional durations.

Drum sounds (*kendhang kalih*)

P = Phung (or thung): a sound produced by striking the big membrane of the *ketipung*, leaves the membrane vibrating after the stroke.

t = Tak: a sound produced by striking the little membrane of the *ketipung*, without releasing the hand.

k = Ket: a sound produced by striking the big membrane of the *ketipung*, without releasing the hand.

b = Dhang: a combined sound produced by striking the big membrane of the *ageng* releasing the hand, concurrently with the sound tak.

t^L = Tlak (or Plak): a sound produced by playing the sounds *phung* and *tak* almost simultaneously

L = Lung: a sound produced by striking (with one finger) the membrane of the *ketipung* and releasing the hand.

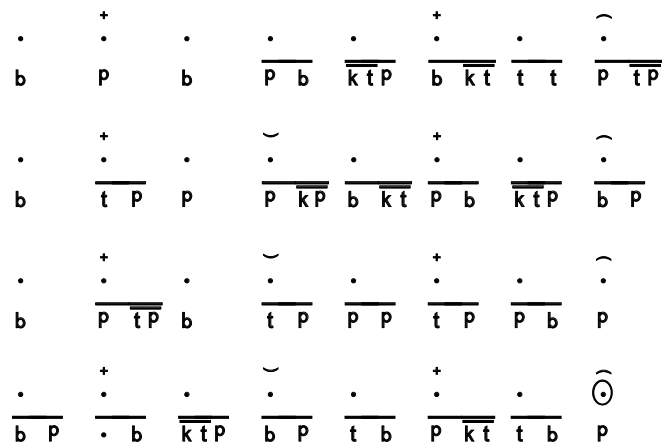
dL = Dhelang: a combined sound produced by striking the big membrane of the *Ageng* and the sound *tak*, almost simultaneously, leaving both membranes vibrating.

kendhangan lancar (irama I – cepat)

•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
P	t	P	P	P	b	P	P	P	b	P	P	P	b	P	P	⊙

kendhangan ladrang (irama I – sedang)

•	•	•	•	•	•	•	•	•
<u>k t</u>	P	<u>t P</u>	<u>k t</u>	P	b	<u>k t</u>	P	•
•	•	•	•	•	•	•	•	•
b	<u>t P</u>	P	P	b	<u>k t</u>	P	b	•
•	•	•	•	•	•	•	•	•
<u>k t</u>	P	b	<u>t P</u>	P	P	b	P	•
•	•	•	•	•	•	•	•	•
<u>t P</u>	<u>k t</u>	P	b	<u>k t</u>	P	b	P	⊙

kendhangan ladrang (*irama II – lambat*)**Kendhang Pinatut.**

Compared to prescriptive models shown previously, which are strictly linked to the form of a composition, the *kendhang pinatut* (or *kendhangan pinatut*) is a more flexible formula, even if it is mostly used in pieces in the form *ladrang*. The term *pinatut* comes from the Javanese *patut*, which means “appropriate/matched with the situation”; the infix *in* is used to give the meaning of “to make something”; thus the term *pinatut* can be interpreted as “to make something in an appropriate way”. While talking with one of my teachers, Pak Didik Supriyantara, I learned how this formula is somehow connected to that is known in Yogyakarta as *semarangan* style. Elaborated by Ki Nartosabdho, this style had wide circulation in the 60s and 70s, mainly due to cassette recordings and radio transmissions. Native of Klaten and trained as *dhalang* (puppeteer) in Surakarta, Ki Nartosabdho was one of those musicians that from the second half of the last century has introduced many innovations both in the shadow puppet theater (*wayang kulit*) and in traditional Gamelan music. From the stories of Pak Didik, what made Ki Nartosabdho so special was his ability to assimilate various musical styles and playing techniques and editing them, thus creating his own unique style.

I have not yet had the opportunity to learn more about aspects of the history of Ki Nartosabdho, so I cannot say if the *kendhangan Pinatut* is his own exclusive creation, or rather, the re-elaborated version of rhythmic formulas already used in the area of Yogyakarta. The fact is that the *kendhangan pinatut* is a rather anomalous formula within the whole prescriptive models of Gamelan music in the tradition of Yogyakarta, even though it is frequently used. One more interesting aspect about this formula is that, even if at the beginning it could be a free interpretation of a single musician, it soon became a specific formula for other musicians. Consequently, today it is performed without significant variations. The *pinatut* formula can be observed as a recent case of crystallization of a personal style, which can possibly explain the evolution of many other formulas, such as the *lancaran* and the *ladrangan* before they became common models used by everyone.

Below there is the prescriptive model taught to me by my first Gamelan teacher here in Yogyakarta, Pak Abujana:

Kendhangan Pinatut (*ladrang*)



The use of the *pinatut* formula and the others illustrated above will be the subject of the analysis in the following pages. I will try to show how the interaction between these formulas is based on principles of combinatorial nature. I will also try to underline how the choices of the drummer can influence the final result of a piece of traditional music.

2. Interaction between rhythmic formulae: combinatorial principle.

Speaking about improvisation in Gamelan, the ethnomusicologist Mantle Hood already realized that if there had to be rules (implicit or explicit) followed by musicians during a performance, these rules were “1) *reasonably simple (when viewed as deep structures)*, 2) *but also capable of generating endless variety and complexity (when Realized as surface structures)*”. (Hood, 1988 : 150). By observing drum formulas as “deep structures”, I tried to identify the generative elements of dynamic processes implemented during the performance of a composition, while also trying to show off the “reasonable simplicity” of the rules that allow the musician to generate infinite variety and complexity of the formulas. I defined “combinatorial” the procedure used in a piece of traditional music for Gamelan. This is based on three elements:

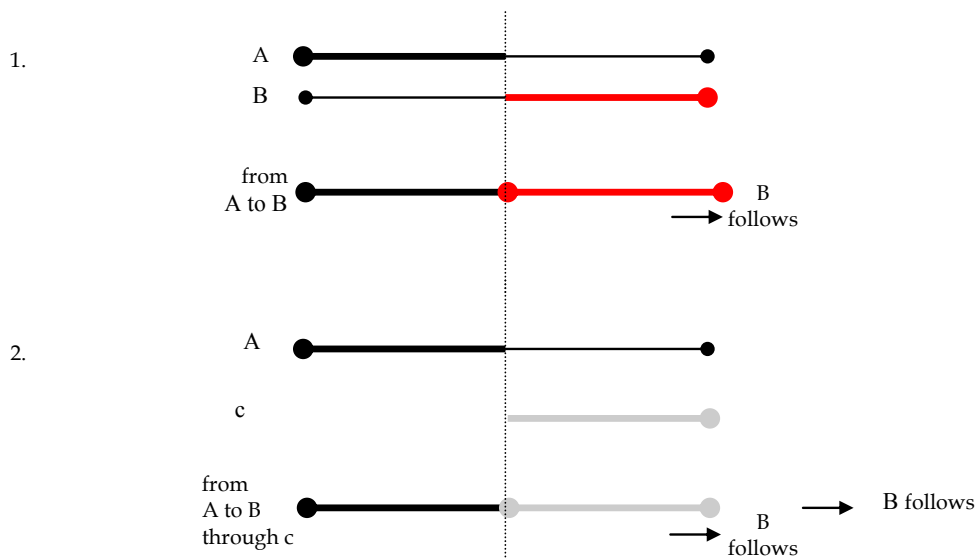
- a) caesura of a rhythmic formula in those moments of composition marked by the colotomic instruments (*gong, kempul, kenong, kethuk, kempyang*).
- b) Re-use and re-contextualization of a formula (or a part of it) in different levels of *irama* and in different musical forms.
- c) time variation.

To understand how the prescriptive models for the drum are subject to manipulations based on a combinatorial principle, I have chosen to present some Gamelan pieces, illustrating the ways of interaction between the *ladrangan* and *lancaran* formulas and the *pinatut* one. The three aspects summarized above will be argued separately, but the reader must keep in mind that they are not organized hierarchically, but rather interconnected.

2.1. Form of a composition and caesura of a rhythmic formula.

First, on the one hand we have rhythmic formulas, on the other hand we have a traditional piece that needs to be interpreted. As previously said, the formulas are not associated directly to a specific song, but to the musical form. This form is defined by the succession of instruments such as *gong*, *kempul*, *kenong*, *kethuk*, *kempyang*. In the case of drum formulas, the moments of a composition marked by these instruments constitute the break points: in other words, the most simple process of manipulation of formulas in a composition is the interruption of it in a structural joint in the form of a composition, which follows the grafting of a new formula. Many of the dynamic processes that take place during the performance of a song depend on the application of this caesura mechanism, such as the change of playing technique by the other instruments, the change of a section of a song (if this one is divided into two or more parts), or even the entry of the vocal part.

During my studies I observed two ways in which the break and graft of two formulas from A to B by inserting in A the rhythmic sequence of B; the second one is realized by inserting in A a special rhythmic sequence “c” which facilitates the passage to the formula B; this intermediate formula can also contain the sequence of strokes of the formula B. To give a first look at what happens, I propose the following two generic models (lines marked with the colors represent the parts of the formula played during the transition process):



The case of *kendhangan pinatut* falls into the second model shown above. I will illustrate two cases, represented by the pieces *ladrang Asmārāndānā* and *ladrang Gonjing miring*. Here the *kendhangan pinatut* interacts differently with the prescriptive model *kendhangan ladrang - irama I*. Apart from the opening section (*bukā*) – which is common to all the traditional pieces of Gamelan music – both the pieces are structured into two sections, *dados* and *ndhawah*. These kind of compositions are known as *lirihan*, in which the vocals are co-leader with instruments such as *rebab* and *gender*. I present them below in cypher notation (we have previously introduced the diacritical marks and the point; the numbers from 1 to 6 indicate the notes, a point above the number indicates the higher octave):

Ladrang Asmārāndānā, Slendro Manyurā

Bukā:

• 533 • 533 1132 66•[Ⓢ]

Dados:

⁺2⁺126 ⁺2⁺123
⁺5321 ⁺3231
⁺6321 ⁺3216
⁺5321 ⁺321[Ⓢ]

Ndhawah:

⁺2321 3216 ⁺2321 5653
⁺6132 ⁺6321 ⁺3632 1561
⁺3632 ⁺6321 ⁺3632 3126
⁺5353 ⁺6321 ⁺3632 312[Ⓢ]

Ladrang Gonjing Miring, Slendro Manyurā

Bukā:

1312 1312 6165 66•[Ⓢ]

Dados:

⁺2126 ⁺2126
⁺2321 ⁺6532
⁺1312 ⁺1312
⁺6165 ⁺212[Ⓢ]

Ndhawah:

⁺2321 3216 ⁺2321 3216
⁺22•• ⁺5321 ⁺3263 6532
⁺1213 ⁺1312 ⁺1213 1312
⁺6356 ⁺2126 ⁺3621 321[Ⓢ]

I only consider the section *dados* of both compositions, because the *pinatut* formula is used in there. I learned the two ways of working out from my first gamelan teacher in Yogyakarta, pak Abujana.

Caesura of a rhythmic formula: *Ladrang Asmārāndā*.

From the example below the reader can observe that the rhythmic formula *kendhangan ladrang* (A) is cut in correspondence to the third *kenong*; the succession *c* is inserted after this point; this one precedes the entire execution of the *pinatut* formula (B), which takes place after the gong.

Ladrang Asmārāndānā, Slendro Manyurā
(dados – irama I)

A

2	1	2	6	2	1	2	3
k	t	P	t	P	k	t	P

5

3	2	1	3	2	3	1	
b	t	P	P	b	k	t	P

6

3	2	1	3	2	1	6	
k	t	P	b	t	P	P	P

5

3	2	1	3	2	1	6	
t	P	k	t	P	b	k	t

3

2	1	2	3	2	1	P
k	t	P	b	k	t	P

5

3	2	1	3	2	3	1	
b	t	P	P	b	k	t	P

6

3	2	1	3	2	1	6	
k	t	P	b	t	P	P	P

5

3	2	1	3	2	1	6	
P	P	P	t	t	.	P	P

c

2	1	2	6	2	1	2	3
b	PPPP	P	PP	.	P	b	PPPP

5

3	2	1	3	2	3	1	
b	PPPP	P	PP	.bb	b	b	tP.

6

3	2	1	3	2	1	6	
P	P	tP.	P	P	.tkb	.tkb	.tkP

5

3	2	1	3	2	1	6	
.L.L	.tP	t	t	b	P	P	b

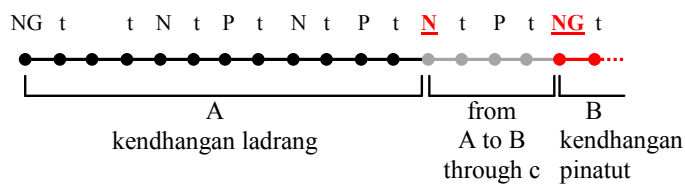
Considering the moment of interaction of the formulas, we can draw the following scheme:

G = gong

N = kenong

P = kempul

t = kethuk



Caesura of a rhythmic formula: *Ladrang Gonjing Miring*.

In this case the break point of the formula *kendhangan ladrang* is in correspondence to the fourth *kenong*, where the formula has already ended. At this point, immediately after the *gong*, the sequence *c* is inserted; the *pinatut* formula is performed after the first *kenong* and it is a part that is a cut off of the entire rhythmic sequence (see next page).

Ladrang Gonjing Miring, Slendro Manyurā
(dados – irama 1)

A

2	1	2	6	2	1	2	6	P
	k	t	P	t	P	k	t	P

2	3	2	1	6	5	3	2	b
	b	t	P	P	b	k	t	P

1	3	1	2	1	3	1	2	P
	k	t	P	b	t	P	P	b

6	1	6	5	2	1	2	6	P
	t	P	k	t	P	b	P	P

B

2	1	2	6	2	1	2	6	P
	P	P	P	t	t	.	P	P

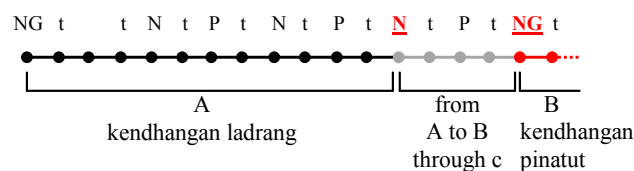
2	3	2	1	6	5	3	2	P
	b	P	P	P	P	P	P	P

1	3	1	2	1	3	1	2	P
	P	P	P	P	P	P	P	P

6	1	6	5	2	1	2	6	P
	P	P	P	P	P	P	P	P

As done in the previous case, we can draw the following scheme:

G = *gong*
N = *kenong*
P = *kempul*
t = *kethuk*



At this point an observation can be made: why does the *pinatut* formula have two ways of interaction in compositions that are formally equivalent? It depends on the particular use of *kendhangan pinatut* in compositions that also contain the vocal part (*lirihan*). Here, this formula is used to accompany the vocals (*gerongan*), as an alternative to the use of rhythmic formulas of *kendang batangan*.

In *ladrang Asmārāndānā* the vocal part is collocated after the *gong*, as we can see in the following example, where the moment of transition between formulas is represented:

$\begin{array}{cccc} 5 & 3 & 2 & 1 \\ \hline p & p & p & t \\ \hline \end{array}$	$\begin{array}{cccc} 3 & 2 & 1 & \textcircled{6} \\ \hline p & p & p & p \\ \hline \end{array}$
$\begin{array}{cccc} 2 & 1 & 2 & 6 \\ \hline b & p & p & p \\ \hline \end{array}$	$\begin{array}{cccc} 2 & 1 & 2 & 3 \\ \hline b & p & p & p \\ \hline \end{array}$
$\begin{array}{ccccccc} \text{Gān} - \text{dā} & \text{a} - & \text{rum} & \text{cah} - & \text{ya} - & \text{ne} & \text{kar} - \text{yā} & \text{wu} - & \text{yung} \\ \hline \cdot & 6 & 1 & 2 & 3 & 5 & 6 & 1 & \cdot & 6 & 1 & 2 & 3 \end{array}$	

In *ladrang Gonjing Miring* instead, vocals begin after the first *kenong*, as follows:

$\begin{array}{cccc} 2 & 1 & 2 & 6 \\ \hline p & p & p & t \\ \hline \end{array}$	$\begin{array}{cccc} 2 & 1 & 2 & \textcircled{6} \\ \hline p & p & p & p \\ \hline \end{array}$
$\begin{array}{cccc} 2 & 3 & 2 & 1 \\ \hline b & p & p & p \\ \hline \end{array}$	$\begin{array}{cccc} 6 & 5 & 3 & 2 \\ \hline b & p & p & p \\ \hline \end{array}$
$\begin{array}{ccccccc} \text{A} - \text{ku} & \text{nya} - & \text{wang} & \text{ke} & \text{nyā} & \text{len} - & \text{cir} & \text{ku} - & \text{ning} \\ \hline \cdot & 2 & 3 & 2 & 1 & 3 & 2 & 6 & 5 & \cdot & 3 & 2 \end{array}$	

From the two examples illustrated above, we can add by saying that the drummer decides when the vocals can enter the composition by using the *pinatut* formula; moreover, the rhythmic sequence *c* has not only the function of linking two different formulas, but also becomes a signal that indicates to the choir (*gerong*) when it is time to sing.

2.2. Re-use and re-contextualization of a rhythmic formula.

This is probably the most interesting aspect of the combinatorial principle. Re-use and re-contextualization of a rhythmic formula can happen in two situations: 1) the same formula can be used in different levels of *irama* in the same musical form, taking advantage of the relation of proportionality between different levels of *irama*; 2) a formula can be used in different musical forms taking advantage of the relation of proportionality between different forms. The difference between two musical forms consists in the level of density of the strokes sequence of *gong*, *kempul*, *kenong*, *kethuk*. When the distribution of a certain accentual schema is “condensed”, it produces a short musical form; when *vice versa* the distribution of the same accentual schema is more “rarefied” we will have a longer musical form.

Between two levels of *irama* of a same composition or between different musical forms there is a substantial ratio of similarity, as there is for two geometric figures. Moreover, in the music of Gamelan this relationship of similarity is strictly proportional and in a strictly arithmetic sense. This similarity represents the second “key” in the process of working out of a piece of traditional Gamelan music. In this process, a rhythmic formula is subjected to a re-framing that offers the possibility to the musician to operate a manipulation on it, in order to make it consistent with the new level of *irama* or with the new musical form in which it is realized.

In the following pages I will present: a) the case of *ladrang Jatikumâra*, in which a part of the *pinatut* formula is used in *irama* II; b) two cases of re-use of some rhythmic patterns of the *pinatut* formula in a piece belonging to a different musical form, i.e. the *lancaran Manyar Sewu*.

Re-contextualization in a different level of *irama*.

The *ladrang Jatikumâra* illustrated below is a composition which consists of two sections (A, B) that can be played both in *irama* I and *irama* II. If played in *irama* II, the part played by the *saron* can change. This change is connected to the use of *kendhangan pinatut*.

Bukâ: *Ladrang Jatikumâra, Pelog Nem*

• 5 5 • 5 6 5 3 2 3 5 6 3 5 3 ②

A

5	3	6	1	2	3	1	2	} if <i>irama</i> II
• 5	3 5	3 6	1 2	1 2	3 1	2 3	2	
5	3	6	1	2	3	1	2	
• 5	3 5	3 6	1 2	1 2	3	1	2	

• 3 5 6 2 1 6 5

3 6 3 2 5 3 5 ⑥

B

5	6	1	2	3	2	1	6
5	6	1	2	3	2	1	6
5	5	•	•	5	6	5	3
2	3	5	6	3	5	3	②

Let us observe now the behavior of the formula *pinatut* in this song. Here the drummer must to consider the relationship of proportionality between the levels of *irama* I and II.

Ladrang Jatikumâra, Pelog Nem (irama II)

	(2)	5	3 ⁺	6	1	2	3 ⁺	1											
		b	.	p	.	b	.	p	b	<u>k t</u>	p	b	<u>k t</u>	t					
t	P																		
	(2)	5	3 ⁺	6	1	2	3 ⁺	1											
		b	.	t	p	p	.	p	<u>k p</u>	b	<u>k t</u>	p	b	<u>k t</u>					
A	P	b																	
	(5)	.	3 ⁺	5	6	2	1 ⁺	6											
		b	.	p	<u>t p</u>	b	.	t	p	p	p	t	p	p					
b	P																		
	(6)	3	6 ⁺	3	2	5	3 ⁺	5											
		b	p	.	b	<u>k t</u>	p	b	p	t	b	p	<u>k t</u>	t					
b	P																		
	(6)	5	6 ⁺	1	2	3	2 ⁺	1											
		b	.	p	.	b	.	p	b	<u>k t</u>	p	b	<u>k t</u>	t					
t	P																		
	(6)	5	6 ⁺	1	2	3	2 ⁺	1											
		b	.	t	p	p	.	p	<u>k p</u>	b	<u>k t</u>	p	b	<u>k t</u>					
A	P	b																	
	(3)	5	5 ⁺	.	.	5	6 ⁺	5											
		b	.	p	<u>t p</u>	b	.	t	p	p	p	t	p	p					
b	P																		
	(2)	2	3 ⁺	5	6	3	5 ⁺	3											
		b	p	.	c	b	<u>k t</u>	p	b	<u>p p</u>	<u>p t</u>	t	.	<u>p p</u>	<u>p p</u>				
b	P																		
	(2)	.	5	3	5	3	6	1	2	1	2	3	1	2	3				
		<u>t p</u>	.	p	p	<u>t p</u>	.	p	p	<u>t k b</u>	<u>t k b</u>	<u>L</u>	<u>L</u>	<u>L</u>	<u>L</u>	<u>t p</u>	t	t	b
C	P	b																	

First of all, we call attention to the sequence of transition from the formula *ladrang – irama II*. The reader will notice that the sequence “ $\overline{p} \overline{p} \overline{p} \overline{t} \overline{t} \cdot \overline{p} \overline{p} \overline{p} \overline{p} \overline{b} \cdot$ ” is inserted after the *kempul*, where the notes “3 5 3 2” are played. The sequence *c* in the form “*ladrang – irama I*” works out the space of eight notes (see 2.11., 2.12.); now, due to the process of expansion of the structure in the level of “*irama II*”, it works out the space of four notes.

If then we look at the rhythmic sequence C used in the first section of the song, where the melody changes, we can trace the rhythmic material of the *pinatut* formula, as follows:

C:

$\overline{p} \overline{p} \quad \overline{t} \overline{p} \cdot \quad \overline{p} \overline{p} \quad \overline{t} \overline{p} \cdot \quad \overline{p} \overline{p} \quad \overline{\cdot t k b} \quad \overline{\cdot t k b} \quad \overline{\cdot L \cdot L}$
 $\overline{\cdot L \cdot L} \quad \overline{\cdot t} \overline{p} \quad \overline{t} \overline{t} \quad b \quad \overline{p} \overline{p} \quad \overline{p} \overline{p} \quad b \quad \cdot$

Kendhangan Pinatut:

$b \quad \overline{\overline{p p p p}} \quad \overline{p} \overline{p p} \quad \overline{\cdot p} \quad b \quad \overline{\overline{p p p p}} \quad \overline{p} \overline{p p} \quad \overline{\cdot p}$
 $b \quad \overline{\overline{p p p p}} \quad \overline{p} \overline{p p} \quad \overline{\cdot b b} \quad b \quad b \quad \overline{t} \overline{p} \cdot \quad \overline{p} \overline{p} \quad \overline{t} \overline{p} \cdot$
 $\overline{p} \overline{p} \quad \overline{t} \overline{p} \cdot \quad \overline{p} \overline{p} \quad \overline{\cdot t k b} \quad \overline{\cdot t k b} \quad \overline{\cdot t k p} \quad \overline{d L} \cdot \quad \overline{\cdot L \cdot L}$
 $\overline{\cdot L \cdot L} \quad \overline{\cdot t} \overline{p} \quad \overline{t} \overline{t} \quad b \quad \overline{p} \overline{p} \quad \overline{p} \overline{p} \quad b \quad \overline{\cdot p}$

The rhythmic sequence C is repeated twice, however the second time, in correspondence to the *kethuk*, it is cut off and followed by the rhythmic sequence of the *ladrang* formula for *irama II*.

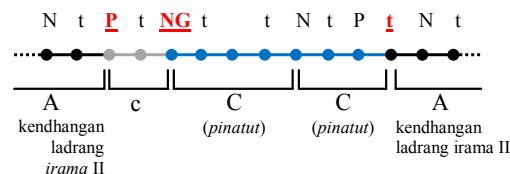
Once again, we can draw a scheme as we did in the previous cases, considering the moment of transition between the *ladrang* formula and the one traced in the *kendhangan pinatut*:

G = gong

N = kenong

P = kempul

t = kethuk



Similarly to what we have seen for the previous pieces, even in the *ladrang Jatikumâra* the drummer’s choices are crucial for the other instruments. If he adopts the formula C, the *saron* group must play the variation in B. Thus, the formula of transition *c* is the signal to which the other musicians will have to pay attention.

Re-use and re-contextualization in a different musical form.

The *lancaran Manyar Sewu* is one of those compositions defined as *soran* (vigorous) where the *saron* group plays the most relevant role. In my experience I have encountered several variations of this composition. I show below a version taught to me by Pak Abujana; it is made by two sections: the first one in which the melody played by the *saron* consists of a regular succession of notes; the second one in which the succession is variable (*ngracik*); each section consists of four *gong* cycles.

Lancaran Manyar Sewu, Slendro Manyura

Bukå:

• • • •	• 1 • 6	• 1 • 6	• 5 • ③
+ + +	+ + +	+ + +	+ + +
• 5 • 3	• 5 • 3	• 5 • 3	• 6 • (5)
+ + +	+ + +	+ + +	+ + +
• 6 • 5	• 6 • 5	• 6 • 5	• 3 • (2)
+ + +	+ + +	+ + +	+ + +
• 3 • 2	• 3 • 2	• 3 • 2	• 1 • (6)
+ + +	+ + +	+ + +	+ + +
• 1 • 6	• 1 • 6	• 1 • 6	• 5 • ③

Ngracik:

+ + +	+ + +	+ + +	+ + +
5 2 3 •	5 2 3 •	5 2 3 5	6 1 6 (5)
+ + +	+ + +	+ + +	+ + +
• 3 6 •	3 6 • 3	6 • 3 5	6 5 3 (2)
+ + +	+ + +	+ + +	+ + +
2 3 2 •	2 3 2 •	2 3 2 •	2 3 5 (6)
+ + +	+ + +	+ + +	+ + +
• 1 • 6	• 1 • 6	• 1 • 6	• 5 • ③

I illustrate two different cases of re-contextualization of the *pinatut* formula rhythmic material, which show the relations of proportionality between the form *ladrang* and the form *lancaran*. In the first one the reader will observe that the rhythmic material of the formulas used to generate the composition is traced within the *pinatut* formula, even if there are special rhythmic patterns inside (i). In the second one, the formula *pinatut* and the relative formula of transition are reproduced entirely (ii).

(i) In the case presented below, the formula *kendhangan lancaran* (A) is repeated three times, working out three of the four cycles of the first section of the song. In the last cycle, a variant of the formula *c* viewed in the previous cases is inserted. In the example, this formula is indicated as *c1*:

Lancaran Manyar Sewu, Slendro Manyurâ (irama I)

A $\frac{5}{P} \frac{5}{t} \frac{3}{P} \frac{3}{P} \frac{5}{P} \frac{5}{b} \frac{3}{P} \frac{3}{P} \frac{5}{P} \frac{5}{b} \frac{3}{P} \frac{3}{P} \frac{5}{P} \frac{5}{b} \frac{3}{P} \frac{3}{P}$

A $\frac{6}{P} \frac{5}{t} \frac{5}{P} \frac{5}{P} \frac{6}{P} \frac{5}{b} \frac{5}{P} \frac{5}{P} \frac{6}{P} \frac{5}{b} \frac{5}{P} \frac{5}{P} \frac{6}{P} \frac{5}{b} \frac{5}{P} \frac{5}{P}$

A $\frac{3}{P} \frac{2}{t} \frac{2}{P} \frac{2}{P} \frac{3}{P} \frac{2}{b} \frac{2}{P} \frac{2}{P} \frac{3}{P} \frac{2}{b} \frac{2}{P} \frac{2}{P} \frac{3}{P} \frac{2}{b} \frac{2}{P} \frac{2}{P}$

c $\frac{1}{P} \frac{6}{P} \frac{6}{P} \frac{6}{P} \frac{1}{t} \frac{6}{P} \frac{6}{P} \frac{1}{P} \frac{6}{P} \frac{6}{P} \frac{1}{P} \frac{6}{P} \frac{6}{P} \frac{1}{P} \frac{6}{P} \frac{6}{P}$

Ngracik:

B $\frac{5}{P} \frac{2}{b} \frac{3}{P} \frac{3}{P} \frac{5}{P} \frac{2}{P} \frac{3}{P} \frac{3}{P} \frac{5}{P} \frac{2}{P} \frac{3}{P} \frac{3}{P} \frac{5}{P} \frac{2}{P} \frac{3}{P} \frac{3}{P}$

(pinatut) $\frac{3}{P} \frac{6}{b} \frac{6}{P} \frac{6}{P} \frac{3}{P} \frac{6}{P} \frac{6}{P} \frac{3}{P} \frac{6}{P} \frac{6}{P} \frac{3}{P} \frac{6}{P} \frac{6}{P} \frac{3}{P} \frac{6}{P} \frac{6}{P}$

$\frac{2}{P} \frac{3}{P} \frac{2}{P} \frac{3}{P} \frac{2}{P} \frac{3}{P} \frac{2}{P} \frac{3}{P} \frac{2}{P} \frac{3}{P} \frac{2}{P} \frac{3}{P} \frac{2}{P} \frac{3}{P} \frac{2}{P} \frac{3}{P}$

$\frac{1}{P} \frac{6}{P} \frac{6}{P} \frac{6}{P} \frac{1}{P} \frac{6}{P} \frac{6}{P} \frac{1}{P} \frac{6}{P} \frac{6}{P} \frac{1}{P} \frac{6}{P} \frac{6}{P} \frac{1}{P} \frac{6}{P} \frac{6}{P}$

If the whole *pinatut* formula works out a *gong* cycle in the *ladrang* form (*irama* I), it works out four *gong* cycles in the *lancaran* form: thus, the proportional relationship between the two forms is 1:4.

As seen in the previous cases, in *Lancaran Manyar Sewu* the use of *pinatut* formula (or the rhythmic material contained in it) has the function to work out the second section of the song. Consequently, the execution of this section depends on the choice of the drummer, who suggests to the other musicians the change of section by playing the formula c (or c1).

3. Time variation and manipulation of formulae.

The third essential element that comes into play in the combinatorial principle is the “time variation”. As said for the concept of *irama*, even the concept of time should deserve its own discussion. In fact, time (*laya*) and *irama* are different and, at the same time, interconnected concepts. These concepts occupy a central role in gamelan music theory and they are subjects of dissonant interpretations. Here, I want to focus the attention only on two aspects, which are relevant for the manipulation of drum formulas, as follows:

- Generally, in Gamelan music all the moments of a performance follow one another without interruption; therefore, time variations are necessary to combine two rhythmic formulas. Time variation is – in other words – the lubricant through which the graft of two formulas is realized in the most balanced way possible. For instance, all the transitions between the different

formulas described in the previous pages are always accompanied by a decrease of time.

- Time variation may determine contractions and expansions of the form of a composition, which has large repercussions on the performance. Since the techniques of each instrument in the gamelan is bound by its specific collocation in terms of proportionality and melodic-rhythmic layering, contractions and expansions of the accentual schema marked by *gong*, *kempul*, *kenong*, *kethuk* or *kempyang* (colotomy) determine changes in the “logical space” of a composition within it is possible to conceive different techniques, as well as new relations of proportionality between the parts. We have previously observed that a formula can be re-contextualized in different levels of *irama*, as in the case of *pinatut* one in the *ladrang Jatikumbara*.

CONCLUSION

In conclusion, when observing the ways of interaction between prescriptive models of the drum, the reader will have noticed a strong arithmetic component in the elaboration of a composition. Although music as art cannot be reduced only to arithmetic calculations, we can say that the work out of a composition through the manipulation of formal models in Gamelan seems to follow a rather strict logic. Perhaps this could be for the “refusal of anarchy” that Mantle Hood was talking about in his *Paragon of the Roaring Sea*, a rejection that leads to the diametrically opposed land of numbers, proportions and formal analogy; or perhaps, because thanks to this particular vision, musicians find their way to interact with each other and generate a rich complexity of interlayered melodies, rhythms and timbres. The concept of combinatorial principle illustrated in these pages, on the one hand explains the way of interaction between the drum’s rhythmic formulas and their capacity to influence the choices made by the entire orchestra during a performance; on the other hand, through this principle we are able to trace a path that attempts to understand the “deep structures” that are the basics of making music in Gamelan *tout court*.

Through the perspective of the combinatorial principle it is possible to analyze the prescriptive models and techniques of many other instruments of the Gamelan of central Java. Furthermore, if we consider the term “combinatorial” in a wider meaning, we could also apply it to the repertoires themselves. For example, let us think about the re-use of the same group of notes in different composition, which is crucial for some authors to define the concept of *pathet*. Or we could even examine the re-use of the same composition into the many contexts (such as the *wayang kulit*, or the *kethoprak* – the Javanese traditional theater –) in which these repertoires are performed until today.

REFERENCES

- Agamennone, M., Facci S., Giannattasio, F., Giuriati G. (1991). *Grammatica della musica etnica*, Bulzoni Editore, Roma.
- Basset, C., Fabien, L. (a cura di). (2001). *Images du monde et traitement du temps dans le gamelan*, in *Les Écritures du Temps – Musique, rite, etc.*, Harmanattam, Ircam/Centre Georges-Pompidou, Parigi (trad. it. Paolo Martinaglia), pp. 93-140.

- Becker, J. (1980). *Traditional music in Modern Java – Gamelan in a changing society*. The University Press of Hawaii, Honolulu.
- Becker, J., Feinstein, A. H. (1984). *Karawitan – source readings in javanese gamelan and vocal music –*, vol. I, Center for South and Southeast Asian Studies, University of Michigan.
- Becker, J., Feinstein, A. H. (1987). *Karawitan – source readings in javanese gamelan and vocal music –*, vol. II, Center for South and Southeast Asian Studies, University of Michigan.
- Benamou, M. (2010). *Rasa – Affect and intuition in Javanese musical aesthetics*, Oxford University Press.
- Heins, E., (1980). *Instrumental Ensembles, in Indonesia*, Londra, New Grove Dictionary of Music and Musicians, pp. 173-9.
- Heins, E. (1993). *Music in Java: current bibliography 1973–1992*. Institute of ethnomusicology Jaap Kunst, University of Amsterdam, The Netherlands.
- Hood, M. (1954). *The nuclear theme as a determinant of patet in Javanese music*, Walters J. B., Groningen.
- Hood, M., McVey, R. (a cura di). (1963). *The enduring tradition. Music and theater in Java and Bali*. In *Indonesia*, Human Relation Area File Press, New Haven Conn., pp. 438-71.
- Hood, M. (1988). *The evolution of javanese gamelan*, book III – *Paragon of the roaring sea –*, Florian Noetzel Verlag, Heinrichshofen-books, Wilhelmshaven.
- Kartiman. (2006). *Gending pamijen gaya Yogyakarta suatu kajian tekstual*. Tesis memenuhi persyaratan mencapai derajat Magister dalam bidang Seni, Minat Utama Musik Nusantara, P. P. Institut Seni Indonesia, Yogyakarta.
- Kriswanto. (2007). *Dominasi Karawitan Gaya Surakarta di Daerah Istimewa Yogyakarta*. Departemen Pendidikan Nasional Biro Perencanaan dan Kerjasama Luar Negeri, Program Biasiswa Unggulan.
- Kunst, J. (1973). *Music in Java – its history, its theory and its technique –*, vol. I. E. L. Heins, The Martinus Nijhoff.
- Martopangrawit, R. L. (1972). *Titilaras Kendangan*, Jilid I-II. Bagian Research Konservatori Karawitan Indonesia, Departemen P. dan K., Surakarta. Nuryakusuma.
- Palen, S., R., M. (1998). *Gendhing-gendhing karawitan gagrag ngayogyakarta*. Taman Budaya, Propinsi Daerah Istimewa Yogyakarta.
- Raden, B. W. K. (1991). *Gendhing-gendhing Mataraman Gaya Yogyakarta dan Cara Menabuh*, Jilid I, K.H.P. Krida Mardawa Karaton Ngayogyakarta Hadiningrat, Yogyakarta.
- Rokhayatum, Tri S. (1987). *Pola tabuhan instrumen balungan dalam gending soran gaya yogyakarta*, tugas Akhir Program studi Sastra Karawitan Jurusan Seni Karawitan Fakultas Kesenian Institut Seni Indonesia, Yogyakarta.
- Siswanto, M. (1977). *Tuntunan Dasar Menabuh Gamelan*. Ikatan Keluarga SMKI Negeri, Yogyakarta.
- Siswanto, M. (1983). *Pengentahuan Karawitan Daerah Yogyakarta*. Departemen Pendidikan dan Kebudayaan, Direktorat Jenderal Pendidikan Dasar dan Menengah, Direktorat Pendidikan Menengah Kejuruan, Proyek Pengadaan Buku Pendidikan Menengah Kejuruan, Yogyakarta.
- Sorrell, N. (1990). *A Guide to the Gamelan*. Faber and Faber, London, Boston.
- Sugiarto, A. (1998). *Kumpulan Gending Jawa karya Ki Narto Sabdho*. Proyek pengembangan kesenian dan kebudayaan Jawa Tengah.
- Sumarsam. (1975). *Introduction to ciblon drumming in javanese gamelan*. Manuscript (1975), in Judith Becker, Alan H. Feinstein (a cura di), *Karawitan – source readings in javanese gamelan and vocal music –*, voll. I-II-III, Center for South and Southeast Asian Studies, University of Michigan, 1984, 1987, 1988: vol. II, pp. 171-201.

- Sumarsam. (1999). *Introduction of javanese gamelan* – notes for music 451 (javanese gamelan beginners); booklet, Middletown, October 1988, revised for Wesleyan's gamelanwebpage,(lastrev.fall2002); <Sumarsam.web.wesleyan.edu/Introgamelan.pdf>.
- Sumarsam. (2005). *La teoria musicale in Asia. Il caso del gamelan giavanese*, in *Enciclopedia della Musica*, vol. V, Giulio Einaudi Editore, Torino. [The edition I own is published by Il Sole 24 ore, Milano, 2006. The essay is contained in the volume VIII: pp. 555-597].
- Suprpto. (1992). *Tabuhan karawitan cara ngayogyakarta hadininnggrat – kendhang (satunggal –kendhang kalih)*. Taman Budaya Propinsi Daerah Istimewa Yogyakarta, Yogyakarta.
- Suprpto. (1995). *Tabuhan karawitan cara ngayogyakarta hadininnggrat – Kendang Batangan*. Taman Budaya Propinsi Daerah Istimewa Yogyakarta, Yogyakarta.
- Susilo, H. (1967). *Drumming in the context of javanese gamelan*, M. A. thesis, University of California Los Angeles (UCLA).
- Sutton, R. A., Titon, J., T., (a cura di) .(2003), *I mondi della musica le musiche del mondo – Asia/Indonesia*. Zanichelli, Bologna, (ed. it. a cura di Tullia Magrini), pp. 284-331.
- Sutton, R A., Suanda, E., Williams, S. (2008). *Java*. In Kartomi M., J., Sutton, R. A., Suanda E., Williams S., Harnish D., *Indonesia*, in *The Garland Handbook of South-East Asian Music*, Miller. E, Sean W. (a cura di). Routledge, New York, pp. 347-405.
- Trustho. (2005). *Kendang Dalam Tradisi Tari Jawa*, STSI Press, Surakarta.